Project Name: Air Quality Monitoring System

Database Management System

Group-10

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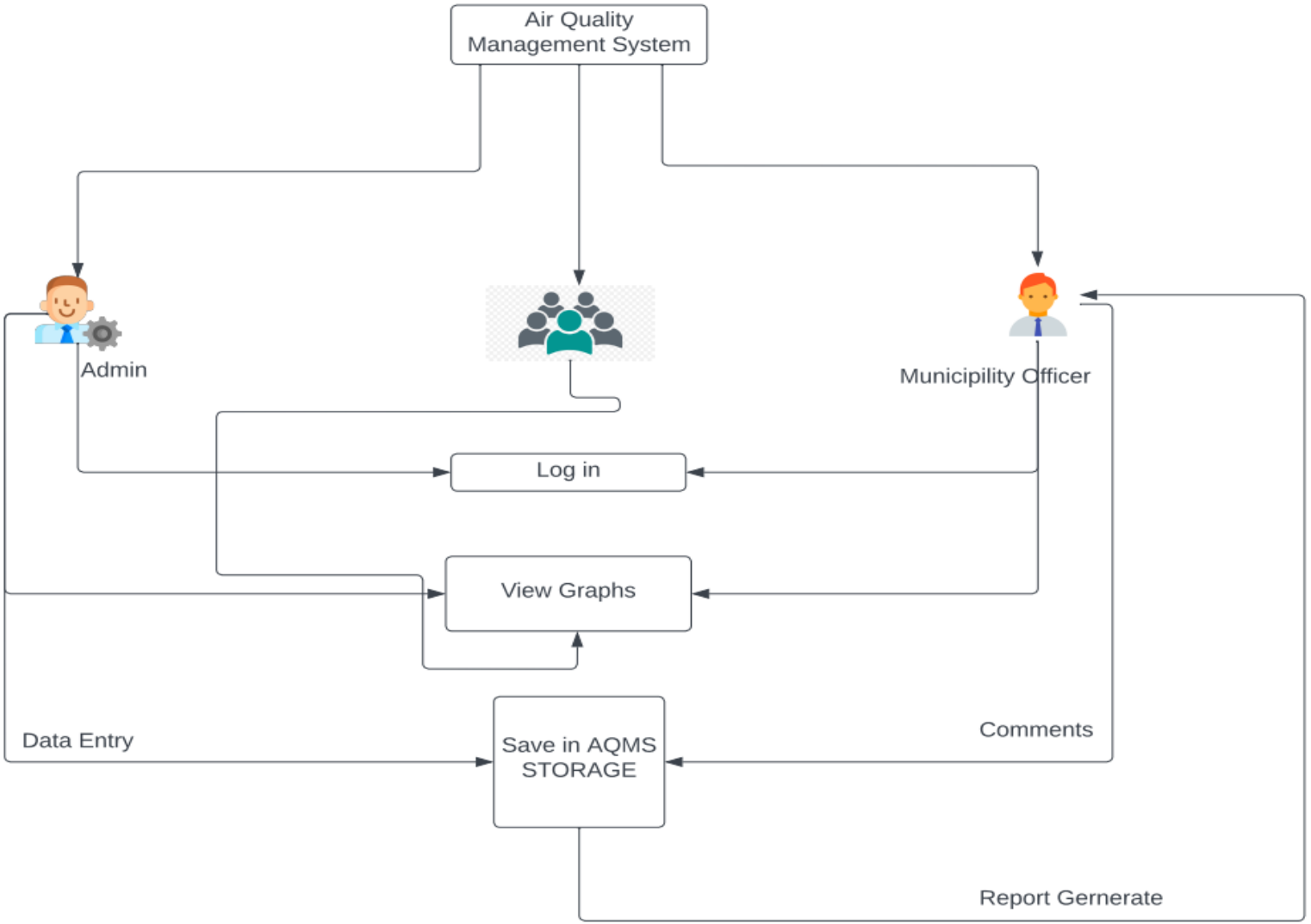
Background of the project

The purpose of this project is to store the air quality data of several locations all over the country in a system and visualize this data through several different graphs. There are two types of users : 'Data entry user' and 'Municipality user'. The 'Data entry' users can input air quality data intothe database. The 'Municipality' users can post comments stating their opinions, view their peers' comments and generate a PDF report containing all the graphs of the application. All the users (admin and non-admin) can viewseveral different graphs generated from the 'air quality data' in the application. They can also search for a divisionand the latest 'air quality data' for that division will be presented in a table.

Rich Picture Of Current System



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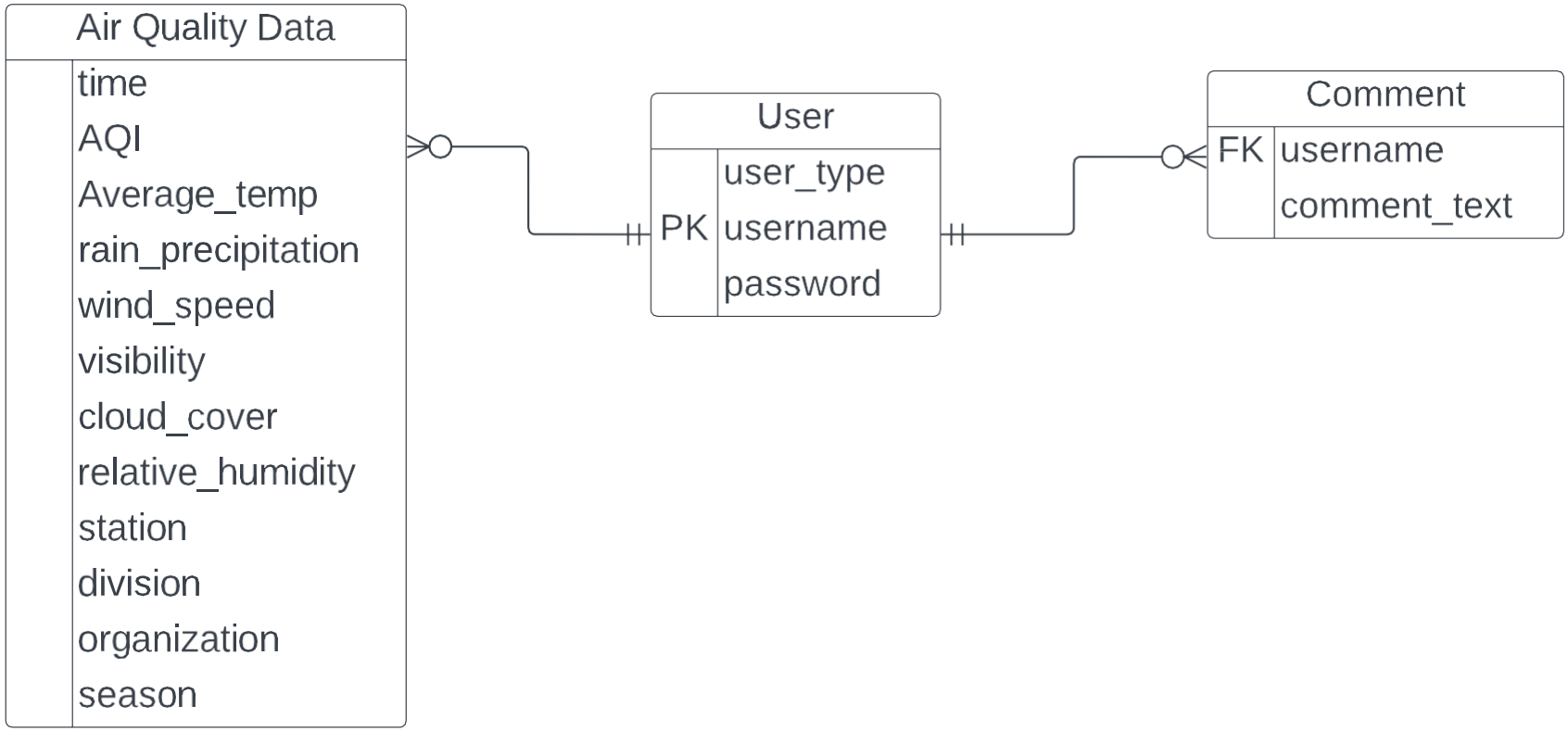
Six Element Analysis For Current System

Process	System Roles					
	Human	**Non-Computing Hardware**	**Computing Hardware**	**Software**	**Database**	**Communication& Network**
Data entry	**1.** Data entry user -They are able to enter AQI data into the database by filling up a form. 2.Municipality user -They are able to post a comment stating their thoughts and comments 3.Normal user -They can type the name of a division and click search to	1.Notebook and pen -The people working at weather stations can write down the measurements they get after using different weather instruments instantaneously on a notebook with a pen.	1.Laptop/ Desktop/Mobile phone -The data entry,municipality and normal users all need one of these devices to input to the application.	1.Operating system -All the users' computers must use an operating system like Windows,Mac OS etc 2.React/Node js web application -The users input data through a web application made by React and Node js	1.MySql -Those working at a weather station can use a MySql database to store all the entries consisting of several weather data.	1.Internet -All the users need access to the internet tobe able to use the AQI applicati

	see its air quality data.			frameworks.		on.

Data verification	1. Data entry user -They need to log in to be able to input air quality data into the system. 2. Municipality user -They need to log in to be able to post comments and see their peers' comments and also to be able to generate a report of all the AQI graphs.	1.Signature/Seals -The people who take measurements in the weather stations would give their signatures or seals on the piece of paper where they would write the weather data for the prupose of maintaining data integrity.	1.Laptop/ Desktop/Mobile phone -All the users would need one of these devices to log into the system.	1. Operating system -All the users' computers must use an operating system like Windows,Mac OS etc 2. React/Node js web application -The users would log into the system through a web application made by React and Node js frameworks.	1.MySql ŦdŚĞ ƶƐĞđŶĂŵĞ̨ƶƐĞđ ŧLJĐĞ̨ĐĂƐƐ‖ž đĚƐ ŽĨ Ăůů ŧŚĞ ƶƐĞđƐ ‖ŝůů ďĞ ƐŧŽđĞĚ ŝŶ Ă DLJ^đů ĚĂŧĂďĂƐĞ̇dŚĞ ĐŽŵŵĞŶŧƐ ŽĨ ŧŚĞ ŵƶŶŝĐŝĐĂůŝŧLJ ƶƐĞđƐ ‖ŝůů Ăů Ɛž ďĞ ƐŧŽđĞĚ ŝŶ ŧŚĞ ĚĂŧĂďĂƐĞ̇	Ϭ/ŶŧĞđŶĞŧ ĐŽŶŶĞĐŧŝŽŶ Ŧ ůů ŧŚĞ ƶƐĞđƐ ŶĞĞĚ ĂŶ ŝŶŧĞđŶĞŧ ĐŽŶŶĞĐŧŝŽŶ ŧŽ ďĞ Ăďů Ğ ŧŽ ůŽŐ ŝŶŧŽ ŧŚĞ ‖Ğď ĂĐĐůŝĐĂŧŝŽŶ̇

ENTITY RELATIONSHIP DIAGRAM



Relational Schema

time	AQI	Average_temp	rain_precipitation	wind_speed	visibility	cloud_cover	relative_humidity	station	division	organization	season

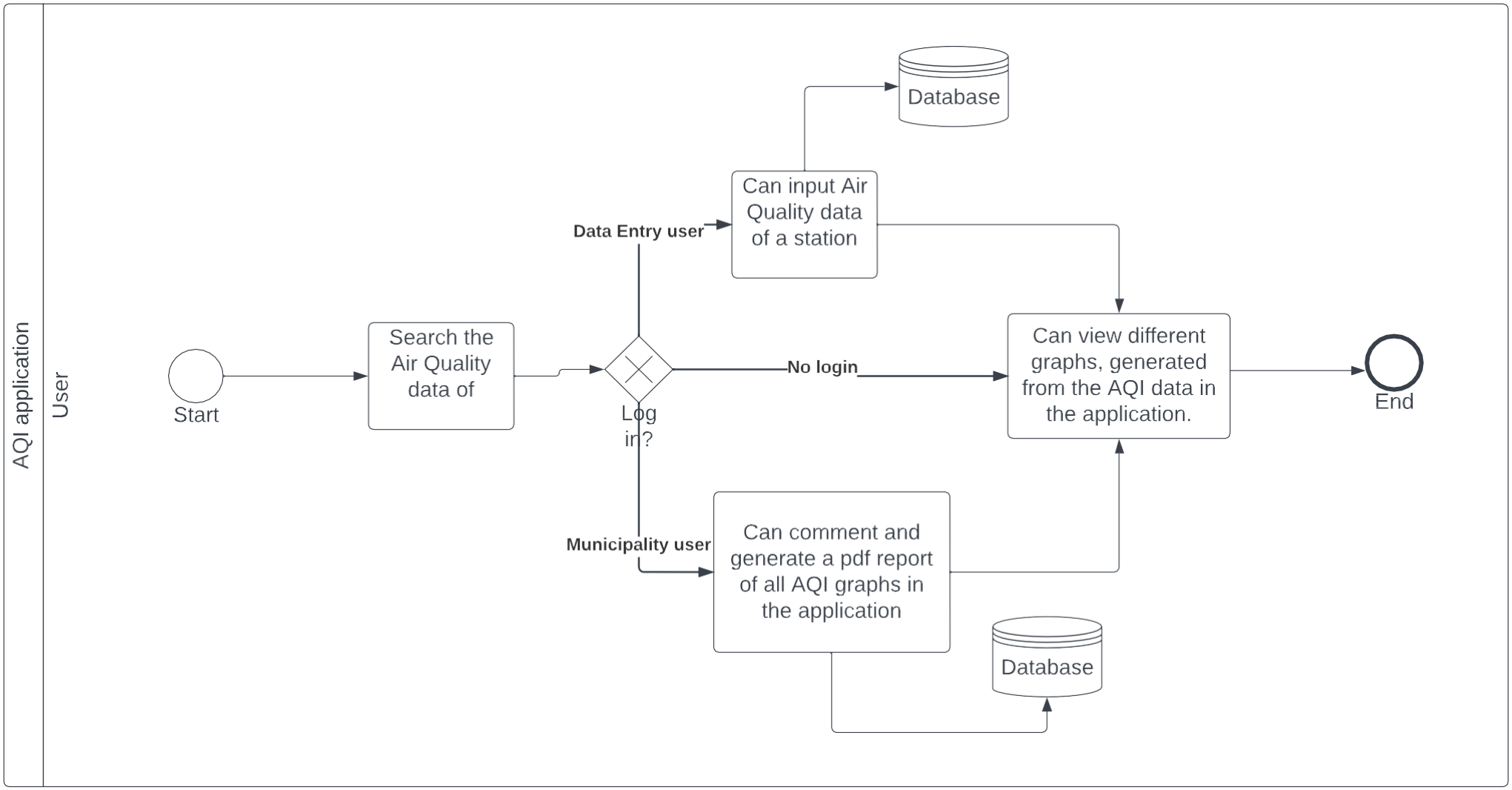
User

username	password	user_type

Comment

username	comment_text

BPMN 2.0 diagram



Data Dictionary

Air Quality Data

Name	Data type	Size	Remarks
time	VARCHAR	20	This is the date at which the air quality data in the row was collected. For example: '3/7/2019'
AQI	FLOAT		This is the value of the AQI of the area . For example : ' 231.5'
Average_temp	FLOAT		This is the value of the average temperature of the area. For example : '25.8'
rain_precipitation	FLOAT		This is the value of the rain precipitation of the area. For example : ' 0'
wind_speed	FLOAT		This is the value of the wind speed of the area. For example : ' 13.4'
visibility	FLOAT		This is the value of the visibility of the area. For example : ' 1.8'
cloud_cover	FLOAT		This is the value of the cloud cover of the area. For example : ' 17.4'
relative_humidity	FLOAT		This is the value of the relative humidity of the area. For example : ' 76.79'
station	INT		This is the station number of the station from which the AQI and other values were measured.For example : ' 5'
division	VARCHAR	20	This is the division in which the station is in. For example : 'Sylhet'
organization	VARCHAR	20	This is the organization which measured the AQI and other values. For example : ' IQAir'
season	VARCHAR	20	This is the season during which the values were measured. For example : ' Winter'

User

Name	Data type	Size	Remarks
username	VARCHAR	20	This is the username of a user.This is our primary key.For example : 'Rafiq_Faisal'
password	VARCHAR	20	This is the password of a user. r example:'apple123'.
user_type	VARCHAR	20	This is the type of user a user is.There are two types of users : 'Data entry' and 'Municipality'.

Comment

Name	Data type	Size	Remarks
username	VARCHAR	20	This is the username of the user who wrote the comment. For example: 'Jalal_Hossain'
comment_text	VARCHAR	20	This is the text of a comment. For example:'The AQI of Dhaka looks great!'

1. Search Bar and Air Quality Table

In this search bar, if we type the name of a division and click 'search', we will be shown this table which will contain the latest air quality data of that division.

Air quality in Dhaka

Air quality index (AQI) and PM2.5 air pollution in Dhaka

IQAir 40.2

Good

Overview

What is the current air quality in Dhaka?

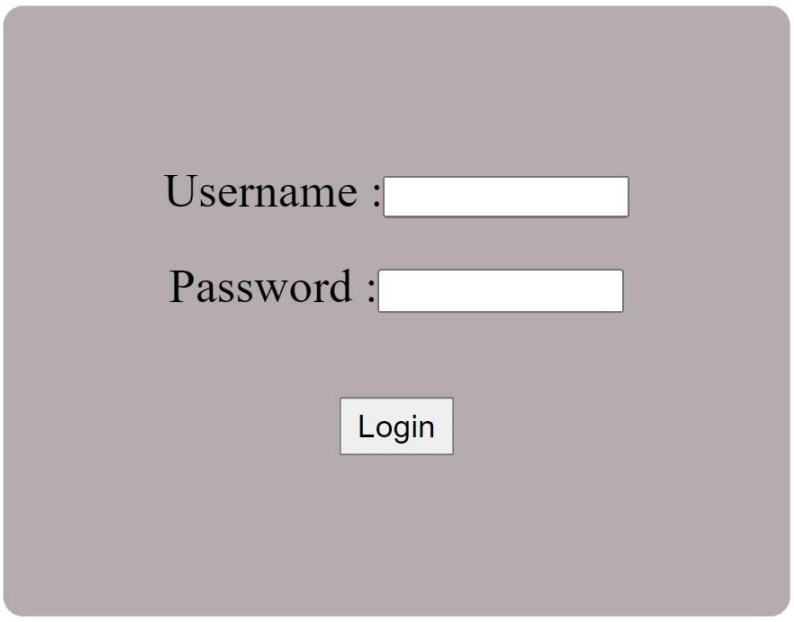
Air pollution level	Air quality index	Main pollutant
Good	40.2	PM2.5
Average Temperature	Rain precipitation	Wind Speed
30.7	0	11.4
Visibility	Cloud cover	Relative humidity
2.5	62.4	70.99

Sql:

```
`SELECT * FROM air_quality_data WHERE
division='${request.query.place}' ORDER BY
str_to_date(time, '%m/%d/%Y') desc limit 1;`
```

2. Login component

Here, a user can log into his account by providing his username and password and then clicking the 'Login' button.

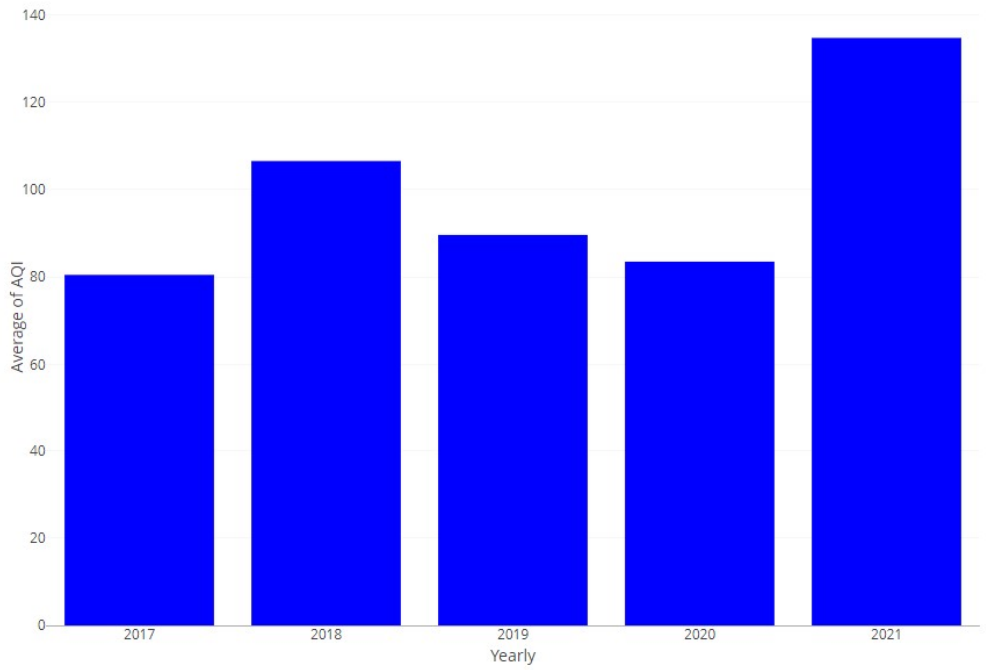


Sql:

SELECT * FROM users

3. Bar Chart of yearly average AQI

This bar chart shows the average AQI of each individual year.

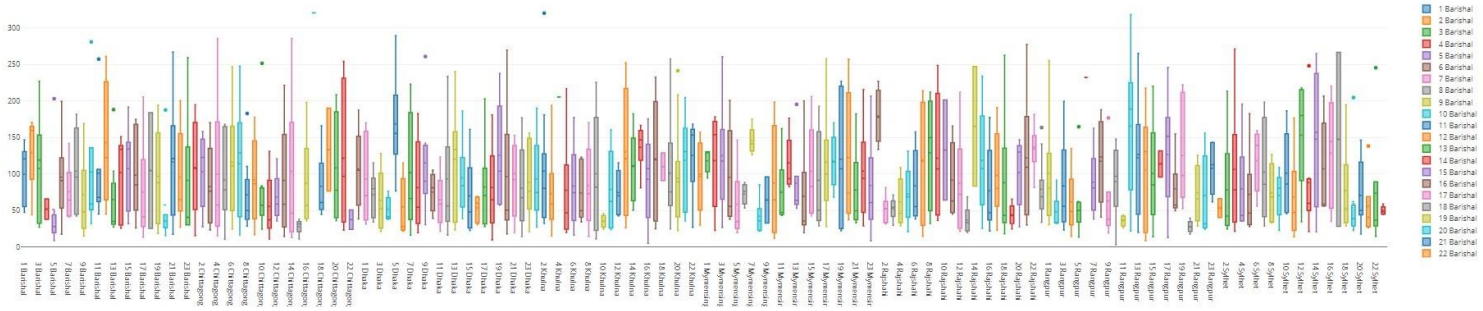


Sql:

```
SELECT SUBSTR(time,-4) AS year_name,avg(AQI)
AS average FROM air_quality_data GROUP BY
SUBSTR(time,-4) ORDER BY SUBSTR(time,-4)
```

4. Box plot of station-wise AQI

This box plot diagram shows the AQI values of each individual station in our database.

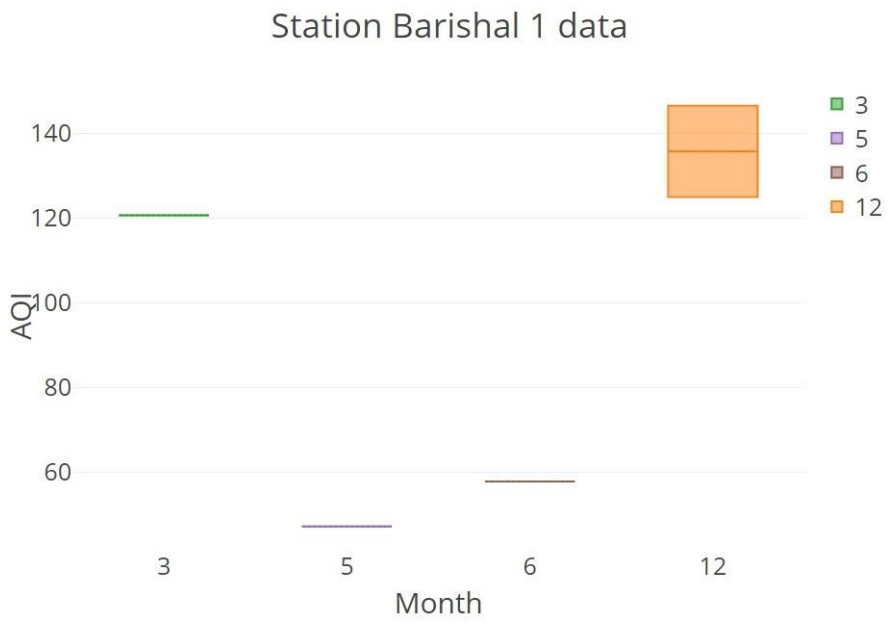


Sql:

```
SELECT AQI,division,station FROM air_quality_data
ORDER BY division,station
```

5. Box plot of month-wise AQI of a station

There is a box plot diagram for every station in our database like the one shown below. The diagram shows a box plot for each of the 12 months in a year.

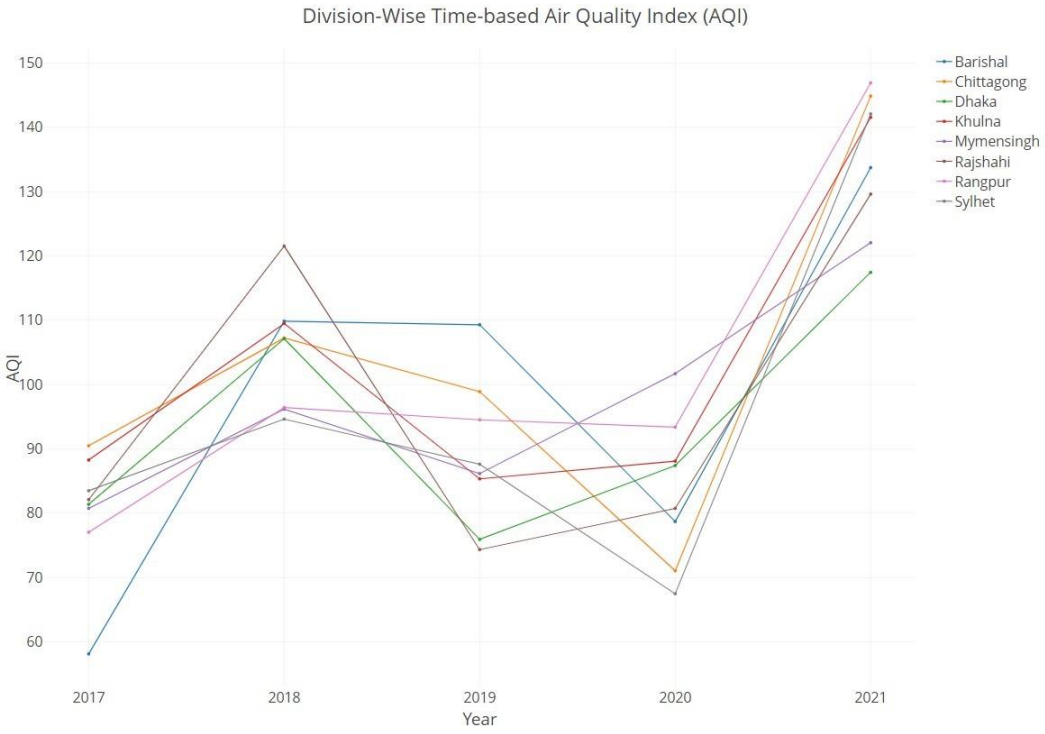


Sql:

```
SELECT SUBSTR(STR_TO_DATE(time, '%m/%d/%Y'),6,2) AS month_no,concat(division,' ',station) AS station_name,AQI FROM air_quality_data ORDER BY division,station,SUBSTR(STR_TO_DATE(time, '%m/%d/%Y'),6)
```

6. Year-wise AQI line chart for every division

This diagram will show a line chart of the average AQI of each year for each division.

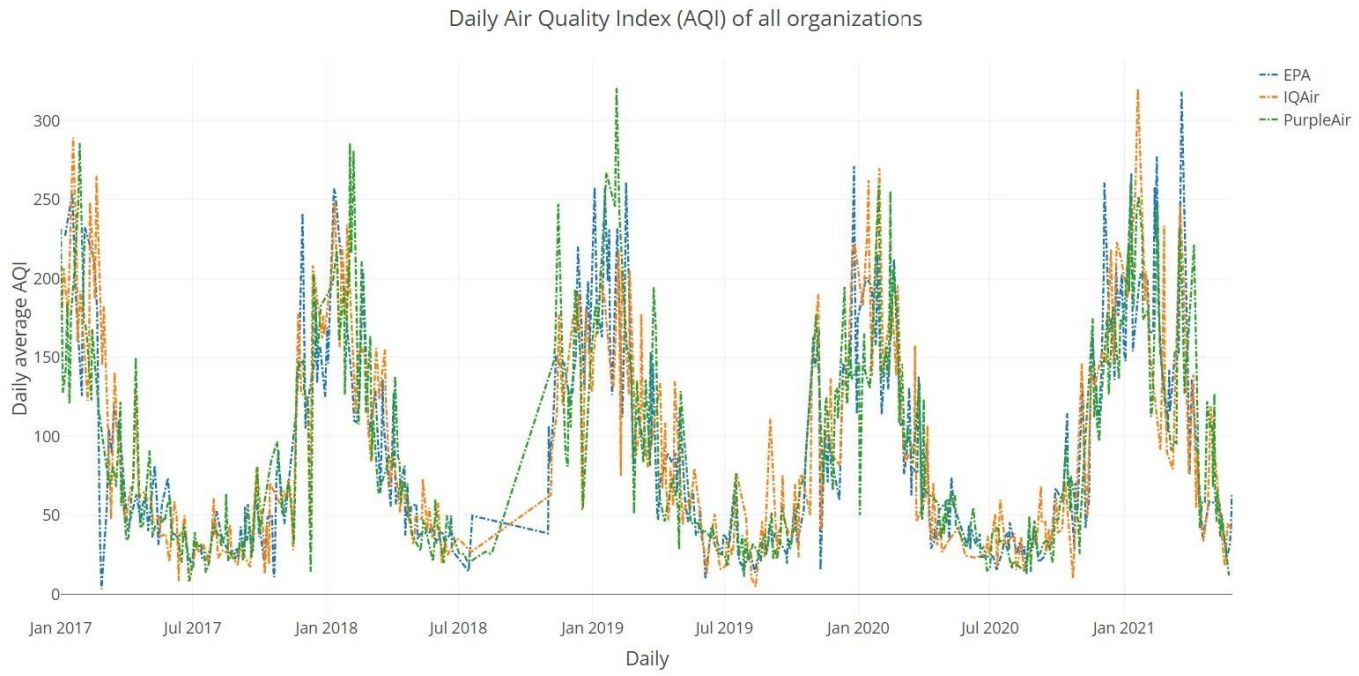


Sql:

```
SELECT division,substr(time,-4) AS
year_name,AVG(AQI) AS average FROM
air_quality_data GROUP BY division,SUBSTR(time,-4)
ORDER BY division,SUBSTR(time,-4)
```

7. Line chart of daily AQI of all organizations

This diagram will show a line chart of the daily AQI values for each organization in our database.

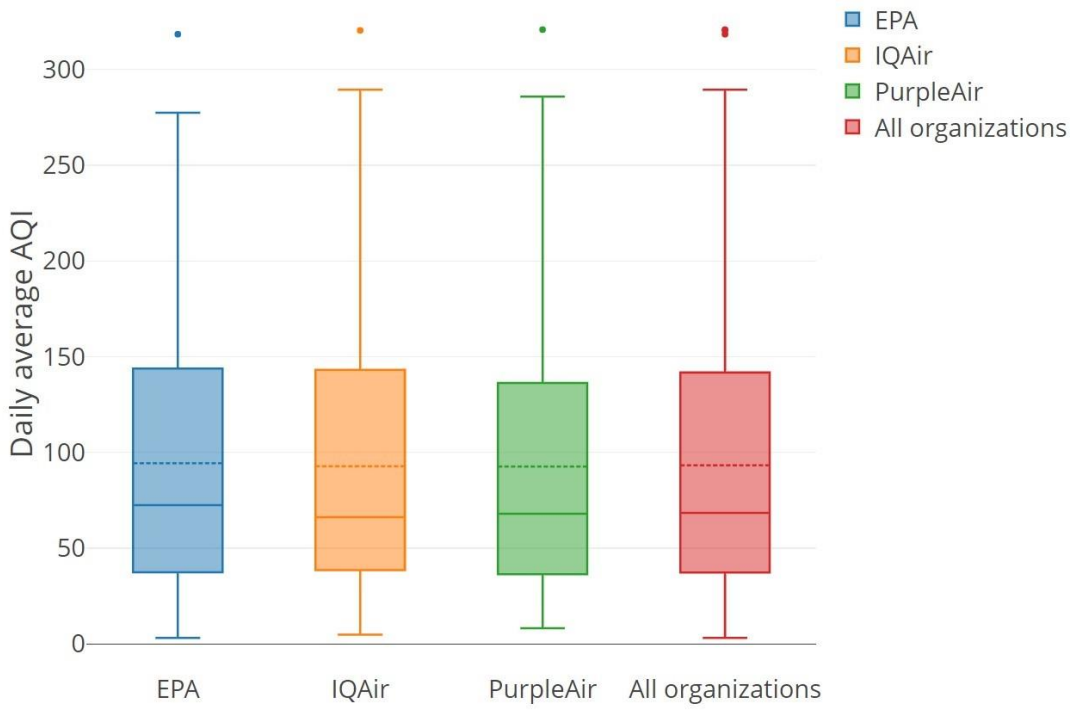


Sql:

```
SELECT time,organization,AQI FROM
air_quality_data ORDER BY
organization,STR_TO_DATE(time, '%m/%d/%Y')
ASC;
```

8. Box plot of daily AQI of all organizations

This diagram will show us a box plot of the average daily AQI values for each organization in our database.

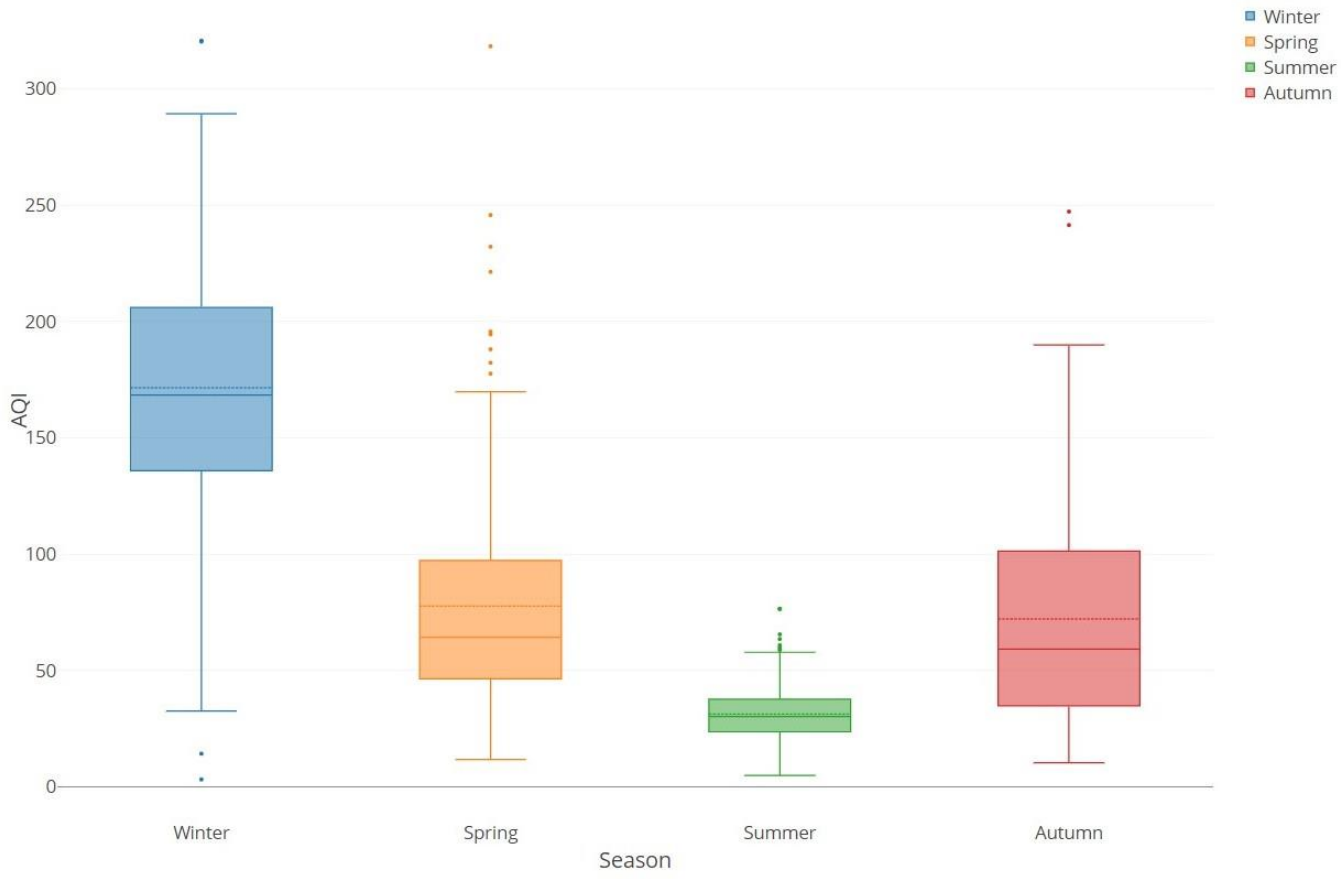


Sql:

```
SELECT time,organization,AQI FROM
air_quality_data ORDER BY
organization,STR_TO_DATE(time, '%m/%d/%Y')
ASC;
```

9. Box plot of AQI of all seasons

This diagram will show us a box plot of the AQI values for each season.

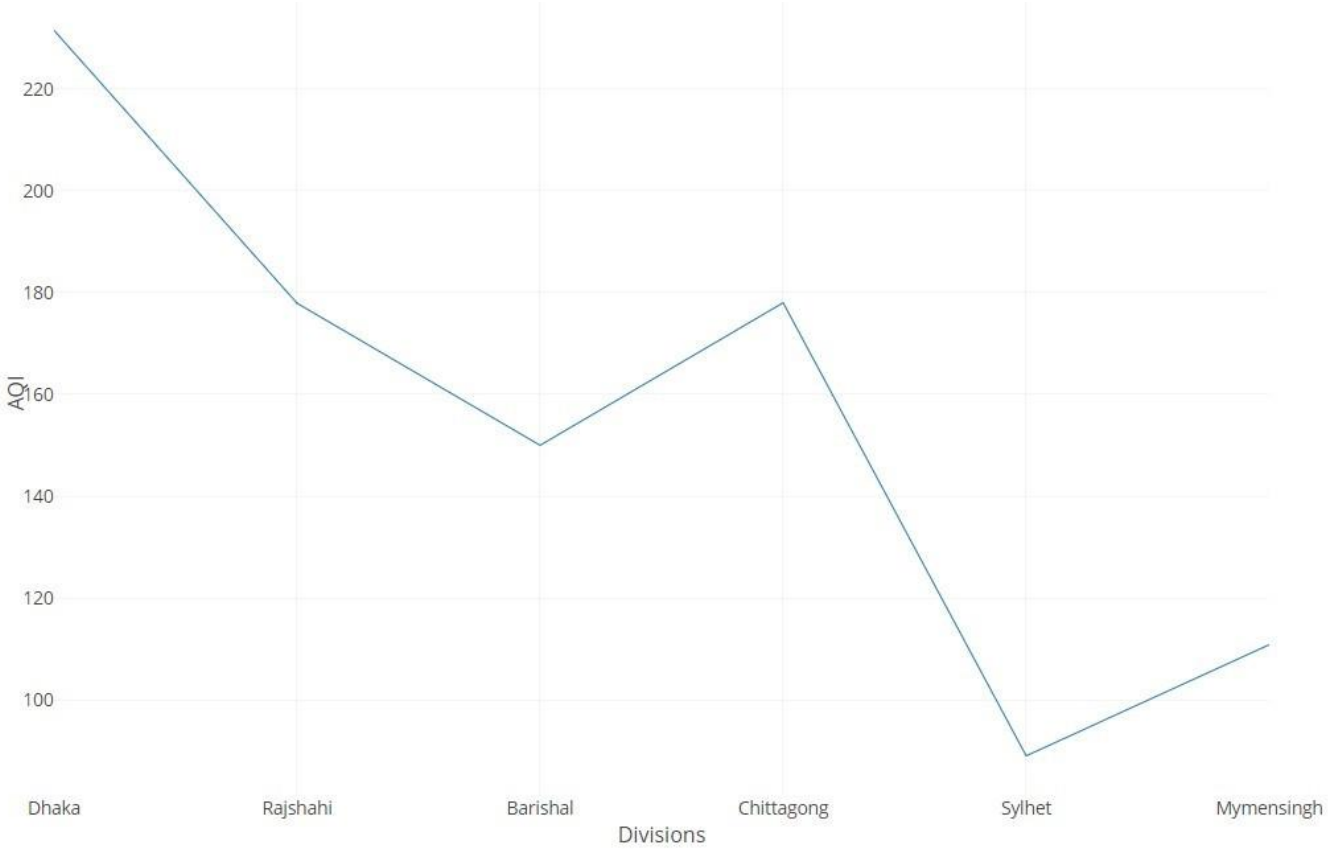


Sql:

```
SELECT season,AQI FROM air_quality_data
ORDER BY season
```

10. Line Chart of today's AQI of all divisions

This is a line chart of today's AQI values of all the divisions.

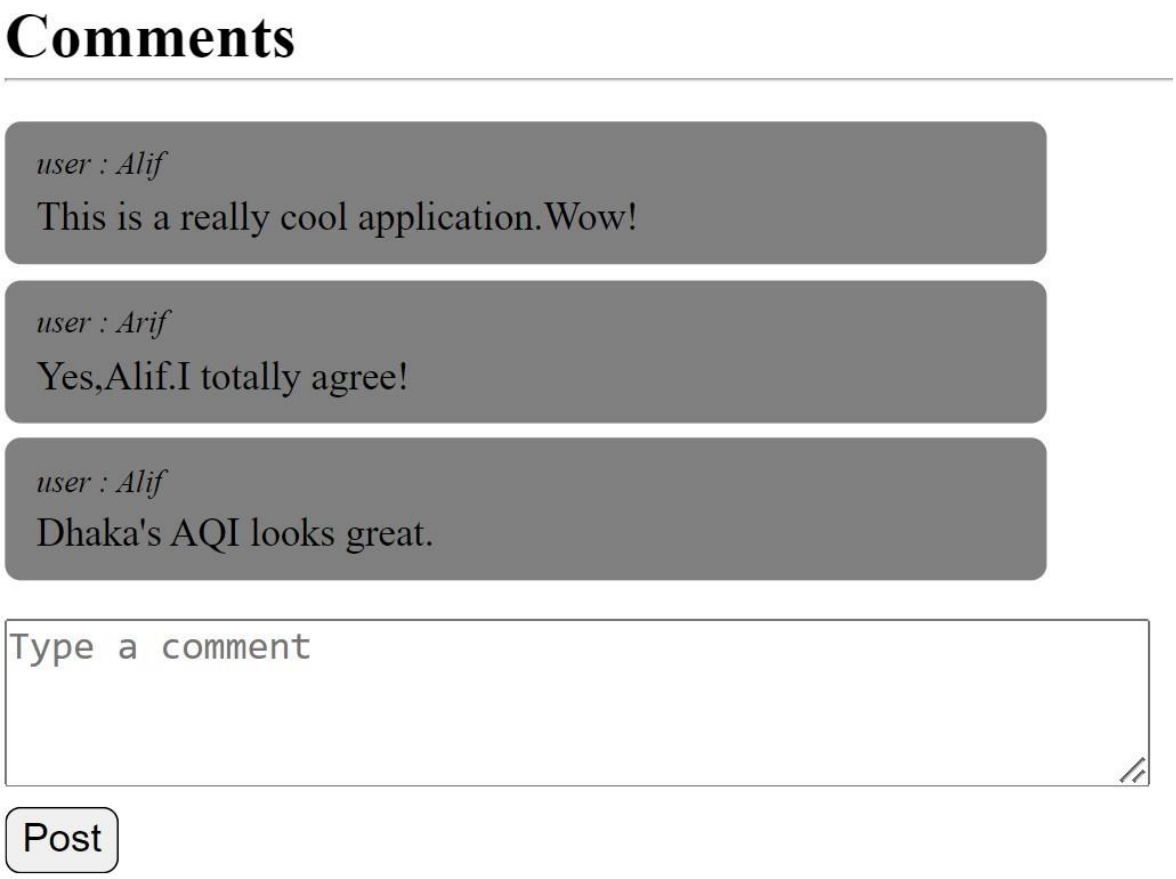


Sql:

```
SELECT AVG(AQI) AS
average_AQI,division,time FROM
air_quality_data GROUP BY time,division
HAVING time=?
```

11. Comment component

'Municipality' users can post comments and view the comments written by other 'municipality' users.Here, we store the comment ' in our database each time a user click's on 'Post'.We fetch all the comments from our database to display it on the screen.



Sql 1:

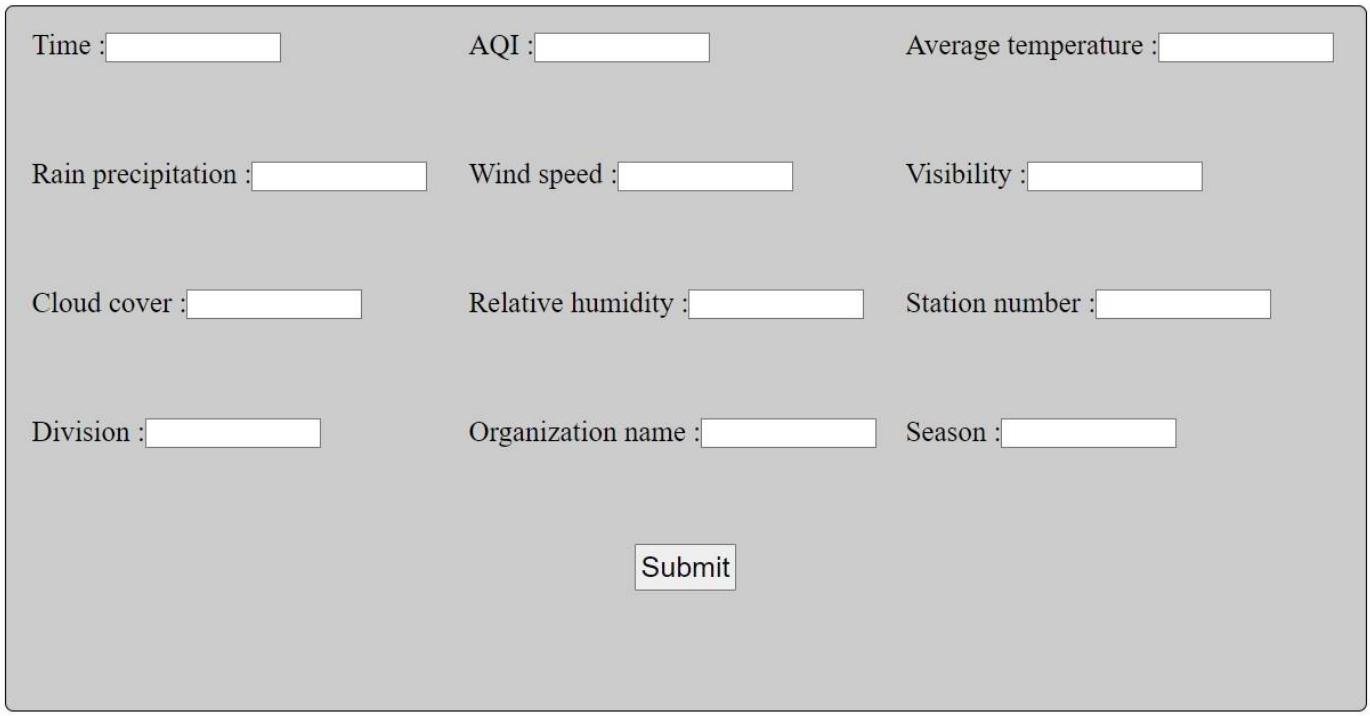
```
INSERT INTO comments VALUES (?,?)
```

Sql 2:

```
SELECT * from comments
```

12. Data entry form

The 'data entry' users can input air quality data into the database through this form.



Sql:

```
INSERT INTO air_quality_data VALUES
(?,?,?,?,?,?,?,?,?,?,?,?)
```